Discrete Frequency = 212.0125 MHz
ATTC Test # 232
Weak Desired Signal Level

Actual Desired Level (dBm)	-67.79
Desired to Undesired Ratio at Threshold (dB)	-50.33

	Threshold
Undesired Power (dBm)	-17.46
Bit	5.35E-07
Error	5.66E-07
Rate	5.08E-07

Test Completed: Tue. May 16, 1995...18:11:53

Discrete Frequency = 212.5125 MHz
ATTC Test # 233
Weak Desired Signal Level

Actual Desired Level (dBm)	-67.79
Desired to Undesired Ratio at Threshold (dB)	-51.08

	Threshold
Undesired Power (dBm)	-16.71
Bit	5.19E-07
Error	4.93E-07
Rate	3.48E-07

Test Completed: Tue. May 16, 1995...18:22:28

Discrete Frequency = 213.0125 MHz
ATTC Test # 234
Weak Desired Signal Level

Actual Desired Level (dBm)	-67.79
Desired to Undesired Ratio at Threshold (dB)	-51.32

	Threshold
Undesired Power (dBm)	-16.47
Bit	2.04E-06
Error	1.20E-06
Rate	1.89E-06

Test Completed: Tue. May 16, 1995...18:33:12

ANALYSIS BY ATTC CHIEF SCIENTIST OF COLOR BEAT FROM UPPER-ADJACENT CHANNEL ATV-INTO-NTSC INTERFERENCE

C.W. Rhodes

ALYSIS BY ATTC CHIEF SCIENTIST OF THE COLOR BEAT FROM UPPER-ADJACENT CHANNEL ATV-INTO-NTSC INTERFERENCE

Expert observers reported the appearance of a "color stripe artifact" during motion within SC picture when ATV was on the Upper Adjacent Channel with respect to the Desired signal. U levels corresponding to CCIR Grade 3 impairment due to this artifact are given "EO&C on BEAT" in Tables 4-1, 4-2 and 4-3 of the ATTC Report. These show that the stripe is the limiting factor in determining the maximum U levels to protect an NTSC signal ATV on the Upper Adjacent Channel.

ATTC has determined experimentally that this color stripe is a beat between the Pilot er component of the ATV signal and the color subcarrier of the Desired NTSC signal. In this ular test, the Pilot Carrier was 210.309 440 MHz - 208.829 545 MHz = 1.479 895 Mhz. This be expressed as a multiple of the NTSC horizontal scanning frequency (Fh):

94.055 556 Fh

When we shifted the ATV signal in channel 13 to make this beat 94.000 000 Fh, the color pes were vertical and present constantly. We then found that these stripes vanished when the TV signal was shifted to make the beat 95.500 000 Fh. However, we then noted a very fine ck and white vertical beat pattern which is the beat between the Desired NTSC visual carrier d the ATV Pilot carrier. The Visual Carrier is 227.5 Fh below the color sub-carrier while the Pilot was then 95.5 Fh above the color subcarrier so the beat frequency was Fh (227.5 + 95.5) = 23 Fh, or 5.05... MHz. This fine beat pattern was visible on 7 of the 8 NTSC receivers with 27" creens. By offsetting the ATV signal by the NTSC frame rate (29.97 Hz), this beat was subject to ame rate interlacing and, therefore, eliminated. This suggests that the color stripe artifact can be controlled by means of precise frequency offset between the Pilot Carrier on the Upper Adjacent Channel and the Visual Carrier of the NTSC signal to be protected. A derivation of the optimum frequency offset is attached (8/31/95).

It will be recalled that the Grand Alliance has specified optimum offsets between co-channel NTSC and co-channel ATV signals. These are:

ATV-into-ATV 19,403 Hz NTSC-into-ATV 911,944 Hz

The optimum offset to protect an NTSC signal on the Lower Adjacent channel is 917,860 Hz. If this is given priority, then the NTSC visual carrier is slightly shifted by 5,914 Hz from one of the nulls in the ATV receiver comb filter. However, these nulls are 900 kHz apart, so this small displacement should be satisfactory.

Precise frequency offset instrumentation is commercially available so that, even when it is deemed desirable to maintain the optimum offset between ATV and NTSC transmitters which are not co-located, this is practical. This same equipment can also provide precise carrier offset between two ATV transmitters. Such equipment may use either the LORAN-C or GPS radio-navigational signal to provide a 10.000 000 MHz reference frequency for frequency synthesizers which provide the needed channel frequencies.

[For further background, see Grand Alliance Comments, pages I-15-3 through 14.]

Attachment

C.W. Rhodes

Attachment

DERIVATION OF THE OPTIMUM FREQUENCY OFFSET BETWEEN ATV PILOT FREQUENCY AND NTSC VISUAL CARRIER FREQUENCIES

1. Given: Pilot Frequency at IF = 44.000 000 MHz + 0.25 (4.5 e 06 x 684/286)

   Fp (IF) = 46.690 559 $\underline{4}$ MHz

2. To eliminate the color stripe artifact for ATV into NTSC from the Upper Adjacent Channel:

   Fp = Fv (n-1), + Fsc + 95.5 Fh
   Fp = Fv (n-1), + 227.5 Fh + 95.5 Fh
   Fp = Fv (n-1), + 3.579 545 $\underline{45}$ MHz + 95.5 63/4004 MHz

3. To eliminate the (observed) luminance beat which is 323 Fh or 5.08....MHz, change Fp by 29.97 Hz.

   Fp (opt) = Fv (n-1) + 3.579 545 $\underline{45}$ MHz + 1.502 622 $\underline{38}$ MHz - 29.97 Hz

   Fp (opt) = Fv (n-1) + 5.082 137 $\underline{86}$ MHz or in terms of Fv(n)
   If and only if Fv(n) = Fv (n-1) + 6.000 000 00 MHz

   Fp (opt) = Fv - 0.917 862 $\underline{14}$ MHz

Note: This differs from the GA specification of 0.911 944 MHz by 5,918.14 Hz.

4. The Up-Conversion Frequency required to shift the IF signal to the assigned channel is:

   LO = Fp (opt) + Fp (IF)

5. Analysis of frequency tolerances required:

   Fv (n-1) can vary ±10,000, according to the required offset the station is licensed to employ, and the tolerance on Fv is an additional ±1,000 Hz. Fv(n) is independently subject to these same tolerances so the frequency difference between these two carriers (nominally 6 MHz) may vary up to ±22,000 Hz. The subcarrier (Fsc) is specified to ±10 Hz. It is not the normal practice to reference Fsc and Fv to the same frequency. However, current technology can readily permit both to be referenced to the same frequency. This measure is not at this time considered necessary, so the ±10 Hz tolerance is the effective limit. The Fp(IF) is specified to ±2.5 Hz as the Symbol Clock is specified to ±10 Hz and is weighted by 0.25 (see #1 above).

   The 44.000 000 MHz IF frequency (see #1 above) can be referenced to the same frequency as the up-conversion frequency. Ideally, the reference frequency for the IF, the LO, the Carrier Frequency Fv for the NTSC stations on channel n, and n+1 would be derived from the same atomic standard which is available as a radio signal from either LORAN-C or GPS radio navigational signals. In which case, the variance in ±12.5 Hz largely due to the color subcarrier variance. That too, could be locked to the same reference frequency, if desired.

C.W. Rhod

Attachmen

PILOT

hannel:

by

CORRESPONDENCE AND OTHER DOCUMENTS

SSWP2-1432
16 May 95

ADVANCED TELEVISION
TEST CENTER, INC.

1330 BRADDOCK PLACE SUITE 200 ALEXANDRIA, VIRGINIA 22314-1650
703/739-3850 FAX 703/739-3230

May 16, 1995

Mr. Mark Richer
Chairman, SS/WP-2
FCC Advisory Committee on
Advanced Television Service
c/o Public Broadcasting Service
1320 Braddock Place
Alexandria, Virginia 22314

Dear Mark:

This letter is to amend the submission to you of March 28, 1995 (attached), by Rich Citta and me, which describes a change in the Test Plan for certain co-channel interference tests. A further change is necessary, as described. While it has taken me some time to write up formally, it was agreed by us as of April 5, 1995, and has been used in the testing.

There are three areas involved:

1. Zenith has advised that recent (internal) tests have shown that the sensitivity factor for carrier offset in the case of co-channel interference from NTSC-into-ATV is much lower than had been expected. Were the carrier offset required to be small relative to the carrier frequency tolerance permitted for NTSC transmitters (*i.e.* ±1000 Hz), then it would have been necessary for both stations to employ some form of precision carrier offset. In order for broadcasters to appreciate this, we had proposed to determine the difference in D/U which precision carrier offset would provide. With Zenith's new findings, however, it appears that we should simply verify that the D/U is little affected by a variation in carrier offset of 1000 Hz, rather than measure the difference in D/U between the "best case" offset and "worst case" offset.

Therefore, we will measure D/U at the specified offset, then change the U frequency by 1000.0 Hz and determine the change in D/U. Of course, should this result not confirm Zenith's expectations, then we would have a large difference. If this is the result, then it would be desirable to pursue establishing the sensitivity factor as to how carrier offset does affect the co-channel D/U for NTSC-into-ATV.

2. Zenith has also reported that it has recently determined that, in the case of co-channel ATV-into-ATV interference:

a) Precise carrier offset affects signal acquisition if, and only if, the two training signals of the ATV signals happen to be time coincident, as would be the case when we test this parameter (inasmuch as it is simulated ATV-into-ATV, given there is only one ATV signal available);

b) The tolerance for each ATV station, beyond which precise carrier offset offers no advantage, is ±5 Hz; and,

c) The true "worst-case" offset is 20 Hz from the specified offset. However, at this worst-case offset, the D/U result is not repeatable, and results become erratic. This makes it useless to conduct the test at a "worst-case" offset, as was earlier recommended.

Therefore, it is proposed to test with the specified offset, and then to change that offset by 10 Hz to determine whether D/U remains substantially the same, and whether it remains repeatable. If not, then a tighter tolerance for carrier frequency would be required, and further tests would be needed to determine it. If further tests were called for, of course, your prior approval would be sought, as always.

3. Finally, it had been proposed to provide a 35 nanosecond difference between the two symbol timings used in ATV-into-ATV co-channel interference testing. (The nominal delay is 20 μsec between the two ATV signals, both of which are from the single Grand Alliance HDTV System hardware here at ATTC.) The difference between the two timings should be 30 nS, which is a more correct value. Therefore, the two delays will be 20.00 μsec and 19.97 μsec.

Cordially,

Charles W. Rhodes

Charles W. Rhodes
Chief Scientist

Attachment

cc. Richard Citta, Zenith/Grand Alliance
Thomas Gurley, ATTC

ADVANCED TELEVISION
TEST CENTER, INC.

1330 BRADDOCK PLACE SUITE 200 ALEXANDRIA, VIRGINIA 22314-1650
703/739-3850 FAX 703/739-3230

March 28, 1995

Mr. Mark Richer
Chairman, SS/WP-2
FCC Advisory Committee on
Advanced Television Service
c/o Public Broadcasting Service
1320 Braddock Place
Alexandria, Virginia 22314

Dear Mark:

Following up on our discussion last week of a change to the Test Plan for co-channel interference testing, I have discussed these with Rich Citta, and we agree and propose the following:

1. The Test Plan (Section 3.7.3.1) states that, for NTSC-into-ATV co-channel interference testing, the proponent shall specify the precise frequency within Channel 12 at which the ATV RF spectrum is to be centered. Presumably, he would specify the optimum frequency which would result in the minimum D/U ratio.

Rich and I have agreed that the test should be repeated with the "worst-case" offset frequency. This would establish the range of D/U that would result if precision offset were not employed. In turn, this would permit assessment of the gain possible with precision offset. Rich has agreed to provide the two frequencies.

2. ATV-into-ATV co-channel also should be tested with both the optimum and worst-case frequency offsets for the same reason. Rich points out that the Test Plan (Section 3.7.3.1) calls for this test to be run with best- and worst-case symbol time offsets, as was done previously. The 8-VSB modem test results (from the January 1994 "bake-off"), however, showed no effect due to symbol time offsets. (Note: 32 QAM did show a sensitivity to symbol time offsets.)

It is claimed that the Grand Alliance system will have the same D/U for this test independent of the symbol timing of D relative to U. This is based upon the measured performance of the 8-VSB modem in the "bake-off" tests. In those tests, the best case for relative symbol timing was set up using a test signal available from the Zenith 8-VSB modem. The "worst-case" symbol timing was set one-half a symbol period earlier or later.

To verify that this is true for the Grand Alliance system, but to eliminate the time required to set up the "best-case" scenario, two different symbol timings will be tested, differing by 35 nS (corresponding to a phase difference of 120 degrees). If D/U is independent of symbol timing, the test results should be in substantial agreement with each other, irrespective of the actual symbol timings.

Should the test results differ significantly, then it will be necessary also to test with the symbols coincident and displaced by 50 nS, as was done during the "bake-off" tests. The GA system will provide the special test signal required to set up the timing.

We appreciate your review and approval of this approach. If you have any questions, please give me a call.

Cordially,

Charles W. Rhodes

Charles W. Rhodes
Chief Scientist

cc: Rich Citta, Zenith
Thomas Gurley, ATTC

PHILIPS

PHILIPS

JUL 2 5 1995

RECEIVED

July 20, 1995

Mr. Charles Rhodes
Advanced Television Test Center
1330 Braddock Place, Suite 200
Alexandria, VA 22314

Dear Mr. Rhodes:

Before changes were made in the Grand Alliance system on June 1, 1995, ATTC experienced difficulty recording the decoder and scan convertor outputs. The difficulty was due to occasional disruptions in H and V sync provided by the GA video decoder and scan convertor to the ATTC tape machines. The disruptions in sync were caused by interaction between phase-locked loops in the Grand Alliance transport and video decoders. The sync was not disturbed enough to cause any noticeable effect on the video when viewed on a video monitor, but there were obvious effects in the recorded video read by the confidence head during recording and output by the tape machine during playback.

Modifications were made on June 1, and the output was recorded without disturbances. On July 12, 1995, the frequency reference in ATTC's Tektronix TSG1001 test signal generator was adjusted, and the transport decoder would not lock to the incoming data. Additional changes were made in the transport decoder on July 12 to correct this. We do not believe any changes made on June 1 or July 12 had any effect on system performance as measured in previous tests at ATTC. Also, the specifications for the delivered system have not changed as a result of the changes, although the changes made on July 12 were to ensure that the system would operate with H and V from ATTC which is within spec.

The transport decoder contains a VCXO which generates a 27-MHz clock. This clock is frequency-locked (but not phase-locked) to 27 MHz at the transmit side of the GA system which is locked to H and V sync from ATTC. There are nominally 900,900 cycles of this clock in a 29.97-Hz video frame (or two 59.94-Hz video frames). To maintain frequency lock with 27 MHz at the transmit side, the output of the VCXO in the transport decoder is divided, and the value in the counter is compared with PCR time stamps which arrive in the bit stream from the transmit side. The results of multiple comparisons are combined digitally and converted to an analog voltage which is used to control the VCXO. Adjustments in the voltage to the VCXO are made in intervals of about one second only if they are needed.

In the video decoder, there are circuits which generate interlaced and progressive pixel clocks having frequencies which are related to 27 MHz from the transport decoder by whole-number ratios. The circuit for each pixel clock contains two phase-locked loops. For the video decoder to properly produce video having frame rates of 29.97 or 59.94 Hz, exactly 2,475,000 interlaced pixel clocks and 2,520,000 progressive pixel clocks must correspond to 900,900 cycles of 27 MHz (duration of 29.97 Hz frame) from the transport decoder.

The difficulty in recording occurred because step changes in the frequency of 27 Mhz from the transport

Philips Laboratories
North American Philips Corporation

345 Scarborough Road
Briarcliff Manor, New York 10510

Telephone: (914) 945-6000
Facsimile: (914) 945-6375
Telex: 646326 philab bfrf

decoder caused disturbances in the phase-locked loops in the video decoder. When this happened, the number of pixel clocks between frame-rate timing pulses in the video decoder was incorrect. This caused small disturbances in H and V sync output to the ATTC tape machines, and the tape machines did not tolerate the disturbances.

The problem was solved by (1) making changes in the transport decoder so it is easier for the phase-locked loops in the video decoder to track changes in 27 MHz from the transport decoder, and (2) optimizing the phase-locked loops in the video decoder. The step changes in frequency generated by the VCXO in the transport decoder were reduced to one-half what they were originally by increasing the attenuation of a voltage divider which drives the VCXO, and the steps were smoothed by increasing the value of a capacitor in the divider. The circuits which generate the pixel clocks in the video decoder were optimized by changing time constants in the feedback paths of one phase-locked loop for each pixel clock, and shorting a resistor in the phase comparator of one of the phase-locked loops for progressive pixel clock. The phase comparator is contained in a Motorola 4044 phase-locked loop IC. It operates in one mode when it senses a negative phase error and another mode when it senses a positive phase error. Shorting the resistor improved the crossover performance between the two modes.

After the modifications were made, performance was checked by forcing larger changes at the input of the voltage divider than will be encountered in normal operation. We observed that when the voltage changes were doubled, (step changes in voltage at input of VCXO were the same size as they were before the divider was modified the first time), there were no problems when ATTC recorded in either format. This showed that smoothing the step changes in frequency and modifying the PLLs in the video decoder were sufficient to correct the recordability problem, and increasing the attenuation of the divider so the changes in frequency of 27 MHz would be one-half the original step size provided an additional margin of safety.

Increasing the attenuation of the voltage divider before the VCXO in the transport decoder reduced the range of the VCXO input voltage. Consequently, the range of frequencies that could be produced by the VCXO was reduced. This became a problem on July 12, 1995, when the frequency reference in ATTC's Tektronix TSG1001 test signal generator was adjusted. The transport decoder could not produce 27 MHz that was locked to ATTC's H and V sync. To correct this, the attenuation of the voltage divider was returned to what it was before any modifications were made, and additional smoothing of the step changes in 27 MHz was employed by doubling the capacitor used to perform the smoothing.

Sincerely yours,

William J. O'Grady

William J. O'Grady
Grand Alliance

cc: *AT&T* - Ralph Cerbone.
GI - Bob Rast.
MIT - Jae Lim.
Philips- Carlo Basile, Aldo Cugnini, Viktor Gornstein.
Sarnoff - Rick Bunting, Paul Lyons, Glenn Reitmeier.
Thomson - Bill Beyers, Kevin Bridgewater.
Zenith - Wayne Luplow.

Sarnoff Research Center | Subsidiary of SRI International | CN 5300 | PRINCETON NJ 08543-5300 | 609-734-2281
Fax 609-734-3105

SSWP2-1456
18 JUL 95

July 18, 1995

Mark Richer
Chairman, SS/WP-2
c/o Public Broadcasting Service
1320 Braddock Road
Alexandria, Virginia

Dear Mark,

This memo is to discuss a difference between the Grand Alliance prototype hardware, tested at the ATTC, and the system as documented and approved by the Technical Subgroup. Specifically, the actual levels of the sync symbols of the VSB transmission prototype subsystem, differ from those documented in the Grand Alliance HDTV System Specification.

The change in sync levels was initiated by Zenith, as they modified their prototype hardware following the transmission bakeoff. In consolidating their design to address both 8 VSB and 16 VSB, the Zenith designers chose to employ a new sync symbol level that would be common to both 8 VSB and 16 VSB. This change was made in optimizing the hardware implementation, but not for systemic reasons. The sync levels in the prototype hardware are slightly lower than the levels documented in the standard. It was only recently that we discovered the difference between the levels in the hardware prototype and the system as documented.

After significant discussion of the technical merits, the Grand Alliance believes that the system should remain as documented. Further, our analysis shows that the testing of the prototype system should also be valid for the system as documented.

Attached is a summary of the transmission tests performed at the ATTC, with the analysis of expected deviation from the change in sync levels. None of the tests show that sync performance to be a limiting factor. In summary, any tests where the ATV signal is the desired signal should benefit slightly from the larger sync levels of the documented system. When the ATV signal acts as an interferor, the larger sync levels of the documented system will represent only a 0.02 dB increase in average power - which we believe to be insignificant.

In a recent teleconference, we reviewed this analysis with you and John Henderson. Of course, we will be prepared to discuss this topic at your upcoming working party meeting.

We expect to modify the field test hardware to represent the sync levels as documented. We will keep you informed of our progress in this area.

Best Regards,

Terrence R. Smith
Director, Television Research

cc: John Henderson
Peter Fannon
Brian James
GA TOG

ATTC LABORATORY TESTS

CO-CHANNEL TRANSMISSION TESTS

[illegible]	Desired Level	Sub Test	Target Spec	Δ		Units	Comments
N	M	TOV		0.02		dB	NTSC Video
	M	CCIR3	< 36.5	0.02		dB	NTSC Video
	W	TOV		0.02		dB	NTSC Video
	W	CCIR3	< 36.5	0.02		dB	NTSC Video
A	M	TOV	< 3.5	0.00		dB	BER
	W	TOV	< 3.5	0.00		dB	BER
	W	TOV		0.00		dB	BER, Δ freq offset
	W	TOV		0.00		dB	Visual
A A	M	TOV	< 16.6	0.00		dB	Delayed ATV Signals (-20 us), BER
	M	TOV	< 16.6	0.00		dB	Delayed ATV Signals (-20÷ us).BER
	W	TOV	< 16.6	0.00		dB	Delayed ATV Signals (-20 us), BER
	W	TOV	< 16.6	0.00		dB	Delayed ATV Signals (-20÷ us).BER

ATTC LABORATORY TESTS

UPPER ADJACENT TRANSMISSION TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
UP-A N	-25 dBm	TOV		0.02		dB	NTSC Video
	-25 dBm	CCIR3		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR3		0.02		dB	NTSC Video
	W	TOV		0.02		dB	NTSC Video
	W	CCIR3	< -12.5	0.02		dB	NTSC Video
UP-N A	S	TOV		0.00		dB	BER
	M	TOV		0.00		dB	BER
	W	TOV	< -43	0.00		dB	BER
UP-A A	S	TOV		0.00		dB	BER
	M	TOV		0.00		dB	BER
	W	TOV	< -37.5	0.00		dB	BER

ATTC LABORATORY TESTS

LOWER ADJACENT TRANSMISSION TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
LO-A N	-25 dBm	TOV		0.02		dB	NTSC Video
	-25 dBm	CCIR3		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR3		0.02		dB	NTSC Video
	W	TOV		0.02		dB	NTSC Video
	W	CCIR3	< -14.5	0.02		dB	NTSC Video
LO-N A	S	TOV		0.00		dB	BER
	M	TOV		0.00		dB	BER
	W	TOV	< -41.5	0.00		dB	BER
LO-A A	S	TOV		0.00		dB	BER
	M	TOV		0.00		dB	BER
	W	TOV	< -37.5	0.00		dB	BER

ATTC LABORATORY TESTS

NTSC TABOO TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
N-8 TABOO A N	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV	< -25.5	0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
N-3 TABOO A N	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV		0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
N-2 TABOO A N	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV	< -23.5	0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video

ATTC LABORATORY TESTS

NTSC TABOO TESTS

	Desired Level	SUB TEST	Target Spec	Δ		Units	COMMENTS
[illegible]00	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV	< 28.5	0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
[illegible]00	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV		0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
[illegible]00	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV	< -12.5	0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
[illegible]00	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV	< -35.5	0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
[illegible]00	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video
	M	CCIR4		0.02		dB	NTSC Video
	W	TOV	< -31.5	0.02		dB	NTSC Video
	W	CCIR3		0.02		dB	NTSC Video
[illegible]15 00	S	TOV		0.02		dB	NTSC Video
	S	CCIR4		0.02		dB	NTSC Video
	M	TOV		0.02		dB	NTSC Video

	M	CCIR4		0.02		dB	NTSC Video
	W	2OV		0.02		dB	NTSC Video
	W	CCIR3	< -22.5	0.02		dB	NTSC Video

ATTC LABORATORY TESTS

ATV TABOO TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
[illegible]3 TABOO	S	TOV		0.00		dB	BER
NA	M	TOV		0.00		dB	BER
	W	TOV	< -53	0.00		dB	BER
[illegible]3 TABOO	S	TOV		0.00		dB	Ghost simulator w/-30 us. BER
AA	M	TOV		0.00		dB	Ghost simulator w/-30 us. BER
	W	TOV	< -53	0.00		dB	Ghost simulator w/-30 us. BER
N-2 TABOO	S	TOV		0.00		dB	BER
NA	M	TOV		0.00		dB	BER
	W	TOV	< -53	0.00		dB	BER
N-2 TABOO	S	TOV		0.00		dB	Ghost simulator w/-30 us. BER
AA	M	TOV		0.00		dB	Ghost simulator w/-30 us. BER
	W	TOV	< -53	0.00		dB	Ghost simulator w/-30 us. BER
N+2 TABOO	S	TOV		0.00		dB	BER
NA	M	TOV		0.00		dB	BER
	W	TOV	< -53	0.00		dB	BER
N-2 TABOO	S	TOV		0.00		dB	Ghost simulator w/-30 us. BER
AA	M	TOV		0.00		dB	Ghost simulator w/-30 us. BER
	W	TOV	< -53	0.00		dB	Ghost simulator w/-30 us. BER
N-3 TABOO	S	TOV		0.00		dB	BER
NA	M	TOV		0.00		dB	BER
	W	TOV	< -53	0.00		dB	BER
N-3 TABOO	S	TOV		0.00		dB	Ghost simulator w/-30 us. BER
AA	M	TOV		0.00		dB	Ghost simulator w/-30 us. BER
	W	TOV	< -53	0.00		dB	Ghost simulator w/-30 us. BER

ATTC LABORATORY TESTS

ATV TRANSMISSION TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
RANDOM	S	TOV	< 18.5	0.00		dB	Ensemble A (5 Multipaths), BER
NOISE		TOV	< 18.5	0.00		dB	Ensemble B (5 Multipaths), BER
-		TOV	< 18.5	0.00		dB	Ensemble C (5 Multipaths). BER
GHOST		TOV	< 18.5	0.00		dB	Ensemble D (5 Multipaths). BER
		TOV	< 18.5	0.00		dB	Ensemble E (5 Multipaths). BER
		TOV	< 18.5	0.00		dB	Ensemble F (5 Multipaths). BER
		TOV	< 18.5	0.00		dB	Ensemble G (5 Multipaths). BER
CO-	W	TOV		0.00		dB	Ensemble A (5 Multipaths). BER
CHANNEL		TOV		0.00		dB	Ensemble B (5 Multipaths). BER
-		TOV		0.00		dB	Ensemble C (5 Multipaths). BER
GHOST		TOV		0.00		dB	Ensemble D (5 Multipaths). BER
		TOV		0.00		dB	Ensemble E (5 Multipaths). BER
		TOV		0.00		dB	Ensemble F (5 Multipaths). BER
STRONGEST	S	TOV		0.00		dB	1 - 30us Echo w Ensemble C. BER
STATIC		TOV		0.00		dB	1 - 5.7us Echo w Ensemble A. BER
GHOST		TOV		0.00		dB	Single 15 us echo. BER
		TOV		0.00		dB	Single 5.7 us echo. BER
		TOV		0.00		dB	Single 1.0 us echo. BER
STRONGEST	S	TOV		0.00		dB	Ensemble A w 1.8us (0 Hz).BER
DYNAMIC		TOV		0.00		dB	Ensemble A w 1.8us (0 Hz).Vis
ECHO		TOV		0.00		dB	Ensemble A w 1.8us (0.05 Hz).BER
		TOV		0.00		dB	Ensemble A w 1.8us (0.05 Hz). Vis
		TOV		0.00		dB	Ensemble A w 1.8 us (0.5 Hz).BER
		TOV		0.00		dB	Ensemble A w 1.8 us (0.5 Hz).Vis
		TOV		0.00		dB	Ensemble A w 1.8 us (5 Hz).BER
		TOV		0.00		dB	Ensemble A w 1.8 us (5 Hz).Vis
		TOV		0.00		dB	Single 1 us echo (2 Hz).BER
		TOV		0.00		dB	
		TOV		0.00		dB	Single 1 us echo (5 Hz).BER
		TOV		0.00		dB	

NOTE: Use only positive delays in ghost simulator.

ATTC LABORATORY TESTS

ATV DISCRETE FREQUENCY TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
FREQ 1	W	TOV	< -39.5	0.00		dB	F= 201.012500 MHz. BER
FREQ 2	W	TOV	< -39.5	0.00		dB	F= 201.512500 MHz. BER
FREQ3	W	TOV	< -39.5	0.00		dB	F= 202.012500 MHz. BER
FREQ4	W	TOV	< -39.5	0.00		dB	F= 202.512500 MHz. BER
FREQ5	W	TOV	< -39.5	0.00		dB	F= 203.012500 MHz. BER
FREQ 6	W	TOV	< -39.5	0.00		dB	F= 203.512500 MHz. BER
FREQ 7	W	TOV	< 12.75	0.00		dB	F= 204.012500 MHz. BER
FREQ8	W	TOV	< 12.75	0.00		dB	F= 204.512500 MHz. BER
FREQ 9	W	TOV	< 12.75	0.00		dB	F= 205.012500 MHz. BER
FREQ 10	W	TOV	< 12.75	0.00		dB	F= 205.512500 MHz. BER
FREQ 11	W	TOV	< 12.75	0.00		dB	F= 206.012500 MHz. BER
FREQ12	W	TOV	< 12.75	0.00		dB	F= 206.512500 MHz. BER
FREQ 13	W	TOV	< 12.75	0.00		dB	F= 207.012500 MHz. BER
FREQ 14	W	TOV	< 12.75	0.00		dB	F= 207.512500 MHz. BER
FREQ15	W	TOV	< 12.75	0.00		dB	F= 208.012500 MHz. BER
FREQ 16	W	TOV	< 12.75	0.00		dB	F= 208.512500 MHz. BER
FREQ17	W	TOV	< 12.75	0.00		dB	F= 209.012500 MHz. BER
FREQ 18	W	TOV	< 12.75	0.00		dB	F= 209.512500 MHz. BER
FREQ 19	W	TOV	< 12.75	0.00		dB	F= 210.012500 MHz. BER
FREQ 20	W	TOV	< -39.5	0.00		dB	F= 210.512500 MHz. BER
FREQ21	W	TOV	< -39.5	0.00		dB	F= 211.012500 MHz. BER
FREQ 22	W	TOV	< -39.5	0.00		dB	F= 211.512500 MHz. BER
FREQ23	W	TOV	< -39.5	0.00		dB	F= 212.012500 MHz. BER
FREQ 24	W	TOV	< -39.5	0.00		dB	F= 212.512500 MHz. BER
FREQ25	W	TOV	< -39.5	0.00		dB	F= 213.012500 MHz. BER

ATTC LABORATORY TESTS

DIGITAL-SPECIFIC ATV TRANSMISSION TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
NOISE	S	TOV	<15.6	0.00		dB	Video Threshold.BER
THRESHOLD	S	TOV		0.00		dB	Video Threshold. Visual
				0.00			Audio Characteristics
IMPULSE	M	TOV		0.00		dB	Video Threshold.BER
THRESHOLD				0.00			Video Threshold.TOV
CO-CHANNEL	S	TOV		0.00		dB	BER versus Visual Observation
-				0.00			2-dimensional curve
NOISE				0.00			

* Video TOV taken as 15.28 dB after averaging over two attenuator settings (1 step)

ATTC LABORATORY TESTS

8-VSB TRELLIS-CODED CABLE TRANSMISSION TESTS

TEST	Desired Level	Sub Test	Target Spec	Δ		Units	COMMENTS
WHITE NOISE THRESHOLD		TOV	< 16.6	0.00 0.00		dB	TOV, PRS
PK/AVE		---	< 6.95	0.03 0.03		dB	99.9% on CDF, Generic method 99.9% on CDF, Boonton method
COMPOSITE 2ND ORDER		TOV	< 25	0.00 0.00		dB	Requires cable testbed
COMPOSITE TRIPLE BEAT		TOV	< 37	0.00 0.00		dB	Requires cable testbed
PHASE NOISE		TOV	< 81	0.00		dBc/Hz	@ 20 Khz Offset
RESIDUAL FM		TOV	> 6.5	0.00		KHz.pk	120 Hz FM Hum
FIBER OPTICS		TOV	> 4.5	0.00		%	Requires fiber optic testbed
CHANNEL CHANGE		EO&C	< 700	0.00		ms	Requires measurement technique
CSO - NOISE		TOV		0.00			2-dimensional curve
CTB - NOISE		TOV		0.00			2-dimensional curve
PHASE NOISE - WHITE NOISE		TOV		0.00			2-dimensional curve
RESIDUAL FM - WHITE NOISE		TOV		0.00			2-dimensional curve
LOCAL OSC INSTABILITY		EO&C	> -89 < -89	0.00 0.00		KHz KHz	Pull-in test Pull-in test
BURST ERROR CORRECTION		TOV TOV	> 169 > 1.05	0.00 0.00		us	us.bursted white noise. 10 Hz rate KHz.bursted white noise.20us pulse
MINIMUM TAP ISOLATION		TOV		0.00		dB	Test requires splitter testbed

ATTC LABORATORY TESTS

16-VSB CABLE TRANSMISSION TESTS

TEST	Desired Level	Sub Test	Target Sped	Δ		Units	COMMENTS
WHITE NOISE THRESHOLD		TOV	<28.85			dB	TOV, PRS
PK/AVE		---	< 5.95			dB	99.9% on CDF, Generic method 99.9% on CDF, Boonton method
COMPOSITE 2ND ORDER		TOV	< 38			dB	Requires cable testbed
COMPOSITE TRIPLE BEAT		TOV	< 49			dB	Requires cable testbed
PHASE NOISE		TOV	< 37			dBc/Hz	@ 20 KHz
RESIDUAL FM		TOV	> 4.0			KHz	120 Hz FM Hum
FIBER OPTICS		TOV	> 4.0			%	Requires fiber optic test bed
CHANNEL CHANGE		EO&C	< 700			ms	BERT measurement technique
CSO - NOISE		TOV					2-dimensional curve
CTB - NOISE		TOV					2-dimensional curve
PHASE NOISE - WHITE NOISE		TOV					2-dimensional curve
RESIDUAL FM - WHITE NOISE		TOV					2-dimensional curve
LOCAL OSC. INSTABILITY		EO&C	> 39 < -39			KHz KHz	Pull-in test Pull-in test
BURST ERROR CORRECTION		TOV	> 129 > 1.45			uS kHz	us.bursted white noise. 10 Hz rate KHz.bursted white noise.20us pulse
MINIMUM TAP ISOLATION		TOV				dB	Test requires splitter testbed